Phasey bean (Macroptilium lathyroides)

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Click on the "Nutritional aspects" tab for recommendations for ruminants, pigs, poultry, rabbits, horses, fish and crustaceans


Common names

Phasey bean, phasemy bean, wild bean, wild bush bean, wild pea bean, one leaf clover, quail bean, wild dolly bean [English]; Murray phasey bean [English/Australia]; pois poison, pois zombie [French/Antilles]; feijão-dos-arrozais, feijão-de-rola, feijão-de-pombinha [Portuguese]; habichuela parada, frijol de monte, frijol de los arrozales, pico de aura [Spanish]; kacang batang [Indonesian]; piinivao [Tongan]; 大翼豆 [Chinese]; ถั่วผี [Thai]

Species

Macroptilium lathyroides (L.) Urban [Fabaceae]

Synonyms

Macroptilium lathyroides (L.) Urb. var. *lathyroides*, *Macroptilium lathyroides* (L.) Urb. var. *semierectum* (L.) Urb., *Phaseolus crotalarioides* Mart. ex Benth., *Phaseolus lathyroides* L., *Phaseolus semierectus* L., *Phaseolus semierectus* L. var. *angustifolius* Benth.

Feed categories

- Legume forages
- Forage plants

Related feed(s)

- Siratro (Macroptilium atropurpureum)

Description

The phasey bean (*Macroptilium lathyroides* (L.) Urban) is an erect branching legume up to 0.6-1 m high. It is usually annual but it is occasionally biennal or a short-lived perennial. In shaded conditions, phasey bean may trail or twin, with vines reaching 1.2 m long. With maturity, the stems become woody at their base. Phasey bean leaves are trifoliate with 3-8 cm long and 1-3.5 cm broad leaflets. The inflorescences are 15-25 cm (-50 cm) long racemes borne on 30 cm long peduncles, and bear red to red-purple (occasionally white or pink) papillionate flowers, 13-15 mm in diameter. The fruits are pubescent, linear, dehiscent pods, 5.5-12 cm long and 2.5-3 cm wide, and contain 20-30 oblong brown seeds that drop easily (FAO, 2012; US Forest Service, 2012; Cook et al., 2005). Phasey bean and its more popular relative siratro (*Macroptilium atropurpureum* (DC.) Urb.) are very similar, but the flowers of phasey bean are lighter in colour than those of siratro.

Phasey bean is mainly used as a pioneer forage that rapidly provides feed in pastures. It can also be cut for hay or silage though it may drop its leaves during drying and handling. As an N-fixing legume, phasey bean is used for green manure and is a valuable cover crop in rotations (FAO, 2012; Cook et al., 2005).

Distribution

Phasey bean originated from tropical America (Central America, the Caribbean Islands, South America) and is naturalized in the tropics and subtropics. It was introduced into India, Australia, Africa and the southern USA. It grows from 23°N to 30°S and from sea level up to an altitude of 1800-2000 m. It is mainly found in wet places along roadsides, on waste lands, in open fields, pastures, and in open situations along streams and rivers (Cook et al., 2005).

Phasey bean grows better in warm conditions (optimum temperature being 25-30°C). It sheds its leaves under frost, but can survive light frost: survival at -8.3°C has been recorded (Milford, 1967; Jones, 1969 cited by FAO, 2012). It can grow where annual rainfall ranges from 450 mm to 3000 mm. In drier places, it may grow in drainage lines or wet depressions. Its resistance to severe drought is due to its free-seeding ability. Phasey bean is tolerant to waterlogging and flooding as its nodulated roots can benefit from water excess (Whiteman et al., 1984; Whiteman et al., 1983). It does well on a wide range of soils from well to poorly drained and deep-sandy to heavy-clayey soils (Odeyinka et al., 2004; Roberge et al., 1999). Optimum soil pH ranges from acidic to alkaline (5-8). Saline soils are fairly tolerated but excess Mn and Al should be alleviated with an application of lime (FAO, 2012; Cook et al., 2005; Jones et al., 1992).

Forage management

Phasey bean is generally considered to be an annual plant. It does not usually regenerate in pastures (Bryan et al., 1973; Roberge et al., 1999), but it can show reasonable persistence (Pitman et al., 1984). Phasey bean seeds and establishes readily in well-prepared seed-beds provided there is not too much competition (FAO, 2012; Cook et al., 2005). It grows vigorously in the warm moist summer period. In the year of sowing, it had one of the highest legume yields observed in Australia and Guinea (Jones, 2001; Barnes, 1999). Dry matter yield may range from 0.5 t/ha in the subhumid subtropics, up to 16 t/ha in pure sward under ideal conditions, such as irrigation (Cook et al., 2005; Barnes, 1999; Klein et al., 1981).

Associations

Phasey bean can grow in association with summer grasses to provide early summer grazing. Companion species include lespedeza species (*Kummerowia stipulacea*, *Kummerowia striata*, *Lespedeza cuneata*), *Chloris gayana*, *Dichanthium aristatum*, several *Paspalum* species (*Paspalum dilatatum* and *Paspalum plicatulum)* and Para grass (*Brachiaria mutica*). Association with Guinea grass (*Megathyrsus maximus*), broadleaf setaria (*Setaria sphacelata* var.*splendida*), and scrobic is successful in well-drained conditions. Warm season legumes that are valuable companions include American vetch (*Aeschynomene americana*), white clover (*Trifolium repens*) and *Desmodium heterocarpon* (Cook et al., 2005). Phasey bean may also be sown in wheat or maize fields (Asongwed-Awa et al., 2002; Muldoon, 1984).

In poorly drained soils or irrigated areas the seeds should be sown into the top of planting ridges (FAO, 2012). For instance, in association with Para grass, phasey bean is sown on the tops of ridges and 2 to 3 months later the grass is sown in the ridges where irrigation water enters. Phasey bean is also frequently grown in Zimbabwe and Sudan, and also in Mali in irrigated cotton rotations where it is used for grazing and for hay (Göhl, 1982).

Pasture

Phasey bean should not be grazed heavily or continuously as this may hamper its viability. Light grazing and/or rotational grazing (leaving at least 10-15 cm growth) followed by a 6 to 8 week rest period in the growing season is adequate to help phasey bean regeneration (FAO, 2012; Cook et al., 2005). As a short-lived legume, *Macroptilium lathyroides* can help to establish grasses such as *Desmodium heterocarpon* which is persistent under grazing, but not easily established (Aiken et al., 1991b). An overseeding of *Paspalum notatum* with a mixture of *Desmodium heterocarpon*, *Aeschynomene americana*, and *Macroptilium lathyroides* was tested with yearling steers. During the establishment period, phasey bean and *Aeschynomene* provided high quality forage, but contributed negligibly during the second year (Aiken et al., 1991a).

Hay and silage

Phasey bean makes good quality hay provided that it is cut and handled early enough to preserve a maximum of leaf material (FAO, 2012). It also makes excellent silage in combination with Columbus grass (*Sorghum x almum*) or alone: it proved to have higher fermentation potential than Guinea grass (Imura et al., 2001; Robertson, 1971 cited by FAO, 2012).

Environmental impact

N-fixing legume, cover crop and biodiversity

Phasey bean is an N-fixing legume that nodulates freely with native rhizobia, making seed inoculation unnecessary. Its association with scrobic (*Paspalum commersonii*) increased forage grass yield by 77% and was found equivalent to the application of 800 kg/ha sulphate of ammonia. After a 3-year cultivation, phasey bean increased soil N content by 10-15% at a depth of 60-90 cm (FAO, 2012). Phasey bean is often cited as a potential cover crop, especially under flooded conditions (Werner et al., 2005). It can also be used in wildlife-food plantings to provide seeds for quail and forage for deer (Newman et al., 2002).

Nematode sensitivity

Phasey bean hosts knot-root nematode and is very sensitive to them. This can become a problem in nematode control (Rich et al., 2010).

Weed

Phasey bean competes with weeds and is seldom referred to as a weed. However, its ability to twin may become a problem in citrus plantations (Barnes et al., 2007).

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Nutritional attributes

Information about the composition of phasey bean forage and seeds is scarce. Phasey bean forage is rich in protein (up to 27% DM) though lower values (under 15% DM) have been recorded. Fibre content is relatively high (average ADF content of 25% DM) but is quite variable. Composition depends on maturity: between 26 and 106 days, the protein content of the leaves decreased from 30 to 20% while NDF increased from 50 to 60%. The ADF content of the leaves rose from 35 to 45% between 26 and 50 days and decreased back to its original value at 106 days (Nakanishi et al., 1993). Other factors influence the composition: flooding increases the amount of structural carbohydrates at the expense of protein content, while drought has the inverse effect (Nagashiro et al., 1995). Longer cutting intervals also had a depressive effect on leaf protein content (Adjei et al., 1985).

Potential constraints

Forage

No evidence of toxicity has been found in cattle or in horses (Cook et al., 2005).

Seeds

Phasey bean seeds contain low levels of non-toxic lectin and moderate amounts of trypsin inhibitors (Grant et al., 1995). They do not require heat-treatment prior to use (Grant et al., 1991).

Ruminants

Whole plant

Fresh forage

There is limited recent information on the nutritional value of phasey bean forage. The protein content is high but is reported to be highly rumen-degradable (75%): a diet based on phasey bean forage should be supplemented with sources of rumen undegradable protein (DiCostanzo et al., 2006). Digestibility is not very high: 50-65% for *in vivo* OM digestibility measured in sheep (Milford, 1967) and about 65% for *in vitro* DM digestibility (Nasrullah et al., 2003; Nakanishi et al., 1993).

Silage

Phasey bean forage ensiled at 60 days regrowth exhibited a good fermentation pattern with a pH under 4.8 and high lactic acid fermentation. Further heat treatment (70°C) of silage did not change the amount of rumen degradable protein (about 45% of the total protein), but decreased the soluble protein content (from 19 to 8% of the protein) (Kawamoto et al., 1997).

Ensiling rice forage and phasey bean forage together improved the fermentation quality and the palatability of rice forage silages, which are lower for rice than for phasey bean (Tobisa et al., 2006; Tobisa et al., 2005). Ensiling phasey bean forage with Napier grass (*Pennisetum purpureum*) improved the nutritive value compared to Napier grass alone (Yunus et al., 2001).

Cattle

Heat treated silage of phasey bean increased the sum of rumen undegradable and indigestible protein (from 36 to 47%) (Kawamoto et al., 1997). Acid detergent insoluble N increased with heat treatment and silage DM (Tamaki et al., 2003) and was partially degradable in the post-rumen digestive tract (Tamaki et al., 2002). Dry matter and N degradability decreased as silage DM increased (Tamaki et al., 2003).

Goats

Goats grazing phasey bean pastures are able to select the leaves, which contain more protein (9% or over) and less fibre than the rest of the plant, and have a higher *in vitro* DM digestibility (75 *vs.* 60%). This selective grazing is made possible by the greater accessibility of the upper layers of pasture, which are younger than the less accessible lower parts (Nakanishi et al., 1993).

Seeds

Phasey bean seeds have a high protein content (27% DM) with an *in vitro* gas production similar to that of *Leucaena leucocephala*. *In sacco* DM degradation is rapid and reaches 92% after 96 hours of incubation. The seeds do not have any significant defaunating activity (Odeyinka et al., 2004).

Pigs

No information found (2012).

Poultry

No information found (2012).

Rabbits

Very few studies have been published on the utilization of phasey bean forage by rabbits. The palatability of the fresh plant

seems good: in a field study conducted in Texas, wild rabbits preferred to graze phasey bean rather than grass in a mixed culture of this legume forage and crabgrass (*Digitaria ciliaris*) (Nguluve et al., 2004).

In the only available study, phasey bean forage (whole plant, 16.8% crude protein and 40% ADF) was harvested and dried in Puerto Rico, sent to Oregon and then incorporated at 40% in a complete diet offered for 21 days to weanling New Zealand White rabbits. The growth rate obtained with this diet was identical (40.6 g/d) to that obtained with the same proportion of alfalfa hay (13.8% CP and 32% ADF). Nevertheless, crude protein digestibility was significantly reduced in the phasey bean diet when compared to that of the alfalfa diet (71 *vs.* 80%) (Harris et al., 1981; Cheeke et al., 1983). From these results, phasey bean could be considered as a suitable forage for rabbit nutrition, but more experiments are required, particularly to determine protein availability.

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Tables of chemical composition and nutritional value

- Phasey bean (Macroptilium lathyroides), aerial part, fresh

Avg: average or predicted value; SD: standard deviation; Min: minimum value; Max: maximum value; Nb: number of values (samples) used

Phasey bean (Macroptilium lathyroides), aerial part, fresh

Main analysis	Unit	Avg	SD	Min	Max	Nb
Dry matter	% as fed	17.8	3.5	11.8	26.2	126
Crude protein	% DM	16.7	3.6	9.6	24.8	140
Crude fibre	% DM	27.0	4.1	20.8	36.2	130
NDF	% DM	43.5	9.9	34.8	58.1	5 *
ADF	% DM	32.4	11.0	15.5	43.5	5 *
Lignin	% DM	6.2	2.8	3.7	10.5	5
Ether extract	% DM	2.8	0.7	1.8	4.5	130
Ash	% DM	8.3	1.7	5.5	12.7	132
Gross energy	MJ/kg DM	18.7				*

Minerals	Unit	Avg	SD	Min	Max	Nb
Calcium	g/kg DM	13.1	2.9	7.8	20.3	127
Phosphorus	g/kg DM	2.2	0.5	1.2	3.8	129
Potassium	g/kg DM	16.4	4.3	10.0	27.2	125
Sodium	g/kg DM	0.4	0.3	0.1	0.6	3
Magnesium	g/kg DM	4.1	0.7	2.7	5.6	126
Manganese	mg/kg DM	99				1
Zinc	mg/kg DM	27				1
Copper	mg/kg DM	8				1

Ruminant nutritive values	Unit	Avg	SD	Min	Max	Nb
OM digestibility, Ruminant	%	59.8	5.8	50.3	64.7	5
Energy digestibility, ruminants	%	57.2				*
DE ruminants	MJ/kg DM	10.7				*
ME ruminants	MJ/kg DM	8.5				*
Nitrogen digestibility, ruminants	%	70.8	10.8	52.8	79.0	5

Pig nutritive values	Unit	Avg	SD	Min	Max	Nb
Energy digestibility, growing pig	%	47.7				*
DE growing pig	MJ/kg DM	8.9				*

The asterisk * indicates that the average value was obtained by an equation.

References

Barnes, 1999; Brink et al., 1988; CIRAD, 1991; Holm, 1971; Milford, 1967; Muir, 2002; Nasrullah et al., 2003

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